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RESEARCH NOTE

Impact of laser induced breakdown spectroscopy on value added snacks of coarse grains

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The present study was carried out with the objective to prepare *Pua, Thalipeeth, Laddo* and *Gatta* by incorporating bajra flour and soya flour, to assess the qualitative analysis elements content by laser induced breakdown spectroscopy. In control, no addition of soya flour and bajra flour was done while in case of experimental treatments $T_{1,}$ $T_{2,}$ and T_3, soya flour was added at 10 per cent, 20 per cent and 30 per cent levels, respectively. In all experimental treatments, 10 per cent bajra flour was kept constant. Each treatment was replicated five times.On the basis of findings, it was concluded that in case of *Pua* and *Thalipeeth,* T_1 (10%) was found to be best in terms of colour and appearance, body and texture, taste and flavour and overall acceptability. In case of *Laddo,* T_2 (20%) was best in body and texture, taste and flavour while T_3 (30%) was found to be best in terms of colour and appearance and overall acceptability. Control of *Gatta* was best with regards to colour and appearance while T_2 (20%) was best in body and texture, taste and flavour and overall acceptability. Elements detected from LIBS spectra for the developed products were carbon, hydrogen, nitrogen, calcium, iron, sodium and magnesium. Hence, it can be concluded that upto 20 per cent soya flour can be successfully incorporated in the prepared products.

Key words : Value added snacks, Coare grains, Bajra flour, Soya flour

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Now-a-days coarse cereals are gaining popularity amongst those who are accustomed to softer cereals like wheat and rice because of the presence of dietary fibre, beneficial in various degenerative diseases. Insoluble fraction of dietary fibre in cereal grains contains large proportion of cellulose, which has beneficial effects in the gastrointestinal tract. The soluble fractions, which mainly consist of pectin, arabinoxylan and β- glucan has the ability to lower blood serum cholesterol, through its tendency to increase viscosity in the intestine. Millets contain higher proportion of unavailable carbohydrate and release of sugar to the blood stream during digestion is slow. Millets contain water soluble gum, β-glucan that is useful in improving glucose metabolism. Therefore, millets are suitable for diabetic diet but the characteristic flavour and difficulty in processing are the limitations for its incorporation in diets. Millet protein contains amino acids in balanced proportions and is rich in methionine, cysteine and lysine. Among millets, pearl millet (Bajra) is the predominant crop of India which is a staple food of rural people of dry land regions of India. In India, pearl millet is the 4th most important staple food crop after rice, wheat and sorghum. Pearl millet is comparable and even superior in some of the nutritional characteristics to major cereals with respect to its energy value, protein, fat and minerals. The coarse grains contain 8-10 per cent husk.The average chemical composition of Bajra grain is as follows: - moisture 12.4 per cent, protein 11.6 per cent, fat 5 per cent, carbohydrate 67.1 per cent, fibre 1.2 per cent and mineral matter 2.1 per cent. The mineral matter is rich in calcium, phosphorus and iron. Soya, the “wonder bean” is becoming popular in our country. It occupies a prominent role in Indian dietaries and is considered as one of the major sources of protein of high nutritional and therapeutic value. Soybean is an excellent healthy food, at a most economical price when compared to other animal protein, which is far beyond the purchasing power of the poor people. Nutritionally, 1 tbsp of soy flour solution in 15 ml of water is equal to that of an egg. 100g of soybean contain 8.1 g-moisture, 43.2 g-protein, 1.5 g-fat, 20.9 g-carbohydrate, 240 mg-calcium, 10.4 mg-iron and 60 mg-phosphorus. The role of soybean as a functional food in India must have been realized considering emerging malnutrition problems and high nutritive value approximately 40 per cent proteins and 20 per cent high quality cholesterol free oil. The study was carried out for qualitative assessment of value added products by laser induced breakdown spectroscopy.

Bajra seeds and soybean seeds and the raw ingredients (*i.e.* refined oil, sugar, jaggery, groundnuts, and Bengal gram flour) which were used in the product formulation were also obtained from the local market of Allahabad. The experiment was carried out in the Foods and Nutrition Department, Halina School of Home Science and research laboratory of Physics department, University of Allahabad. Bajra flour and soy flour in the atta maker to make the flour. Four recipes namely- *Laddo, Thalipeeth, Pua* and *Gatta* were developed by incorporating bajra flour and soy flour at three different levels of incorporation. The products were prepared by using standard recipes.The basic recipes were standardized and served as control (T_0). Three treatments

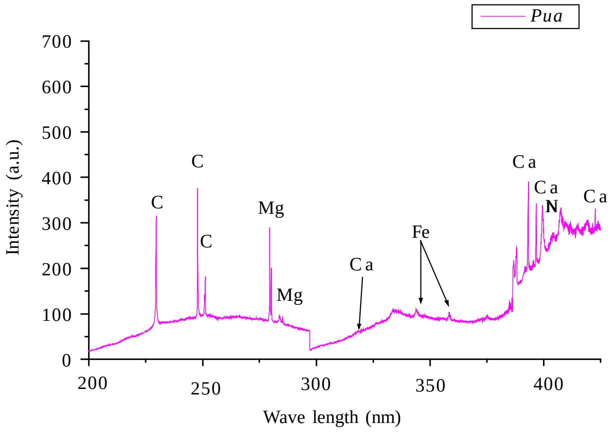

Fig.1: LIBS Spectra of *Pua*

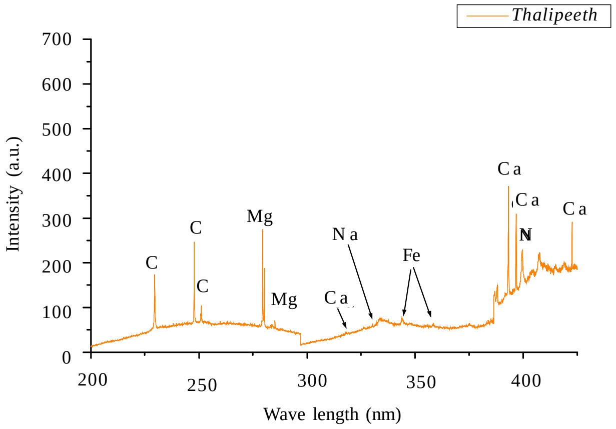

Fig. 2: LIBS Spectra of *Thalipeeth*

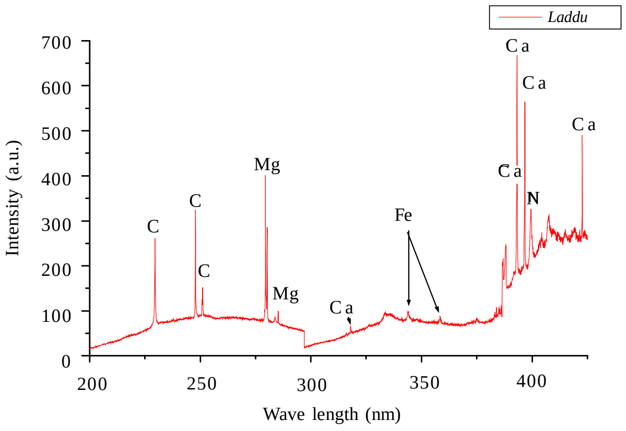

Fig. 3: LIBS Spectra of *Laddu*

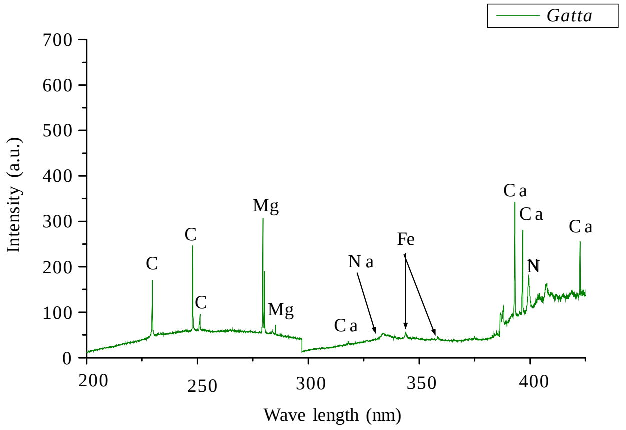

Fig. 4: LIBS Spectra of *Gatta*

i.e. incorporation of bajra flour and soy flour at different levels with wheat flour were referred to as T_1, T_2 and T_3, respectively for each of the four products developed. The experiment was replicated five times to get an average value.A high energy laser is focused on the sample material (solid, liquid or gas) which causes target material to undergo rapid local heating, vaporization, dissociation, ionization of its atoms and the atomic emission from the expanding plasma plume that is formed during the laser-matter interaction provides valuable information about the composition of the target material on the screen connected on-line. Four products namely- *Pua*, *Laddo, Thalipeeth* and *Gatta* were subjected for elemental analysis by LIBS. Thus, the elements detected by LIBS were carbon, magnesium, calcium, iron and nitrogen for the four products.

The best treatment T_1 on the basis of sensory evaluation was subjected for elemental analysis by laser induced breakdown spectroscopy. From the LIBS spectra obtained for *Pua*, *Thalipeeth*, *Laddo* and *Gatta*, it is concluded that these products consisted of elements like: carbon, hydrogen, nitrogen, calcium, iron, sodium, and magnesium (Fig. 1-4).

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